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Balestrieri

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(54) **TELESCOPIC ROD FOR HANDLING A TOOL**

(71) Applicant: **FUEGO INVEST & FINANCE CORP.**, Road Town (VG)

(72) Inventor: **Rita Balestrieri**, Cureglia (CH)

(73) Assignee: **FUEGO INVEST & FINANCE CORP.**, Road Town (VG)

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USPC 16/429; 81/489; 30/296.1; 294/210; 15/144.4
See application file for complete search history.

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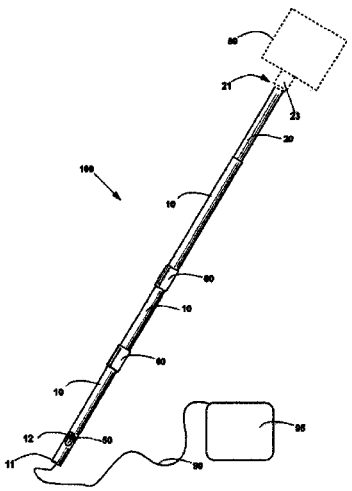
Primary Examiner — William Miller
(74) *Attorney, Agent, or Firm* — Ladas & Parry LLP

(57) **ABSTRACT**

A telescopic rod in order to use objects or tools at a desired height above the head of a user, in particular for harvesting fruit from trees or for pruning tree branches or painting high walls or ceilings, comprises a rod base with a base end, a rod extension slidingly engaging with the rod base, a support member configured to support a tool, arranged at a support end of the rod extension opposite to the rod base, an actuation means to automatically push/pull the rod extension with respect to the rod base, a rod actuation command at said base end to operate the actuation means between a push position, in which the actuation means pushes said rod extension to elongate said rod, a pull position, in which the actuation means pulls the rod extension to shorten the rod, a standby position in which the actuation means is inoperative and the rod can be used at a desired rod length to maneuver the tool at a desired height.

21 Claims, 6 Drawing Sheets



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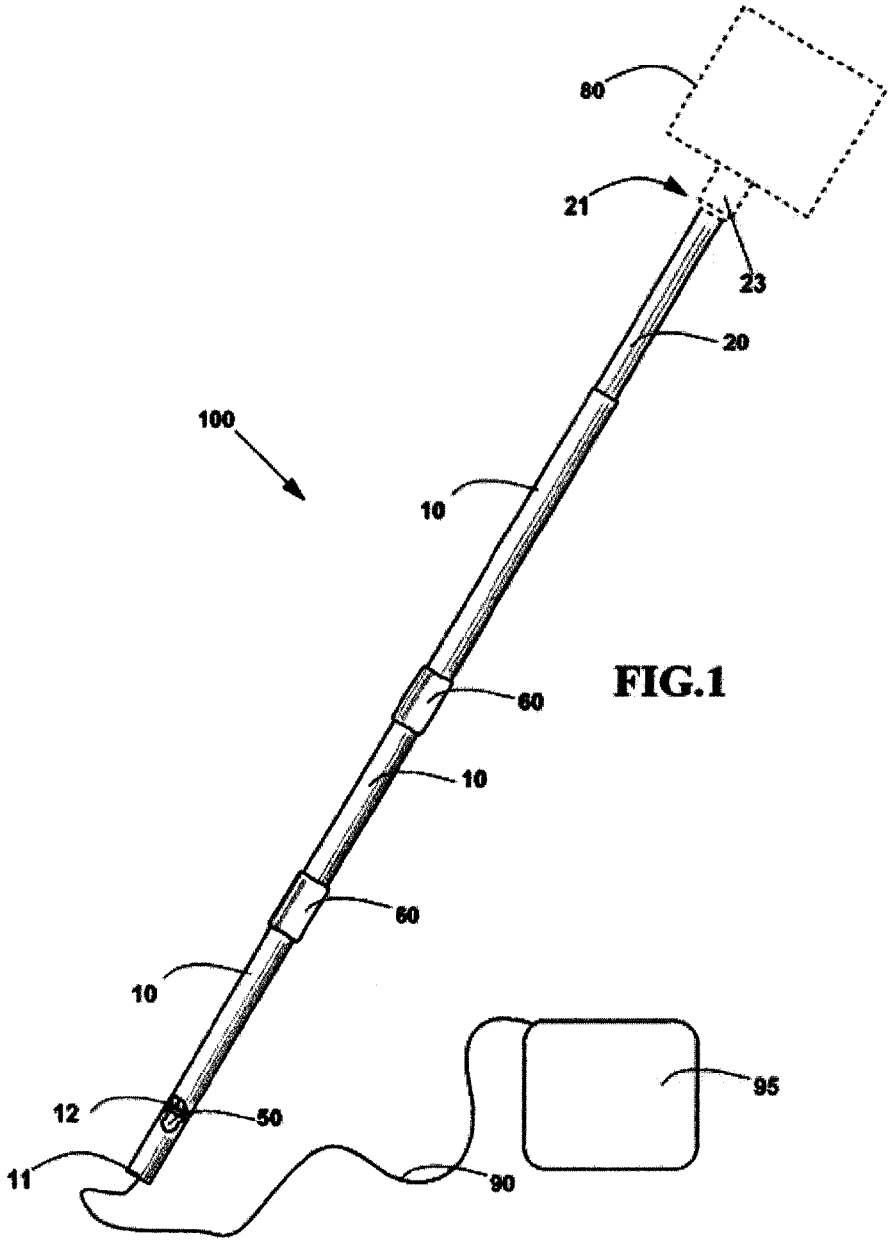


FIG.1

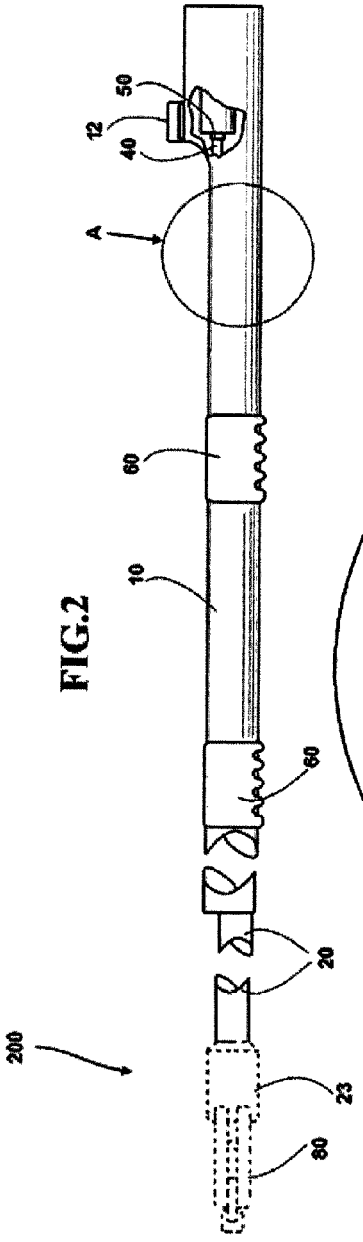


FIG.2

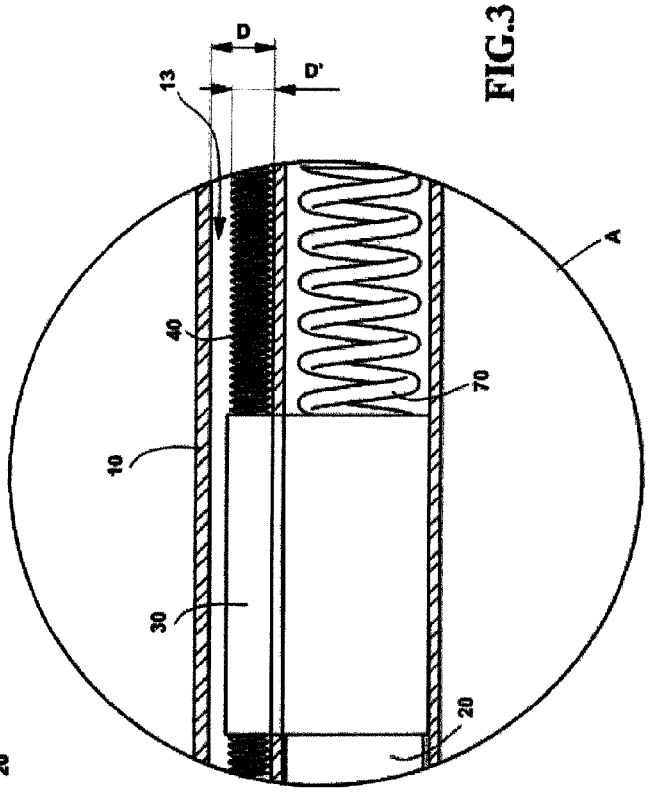


FIG.3

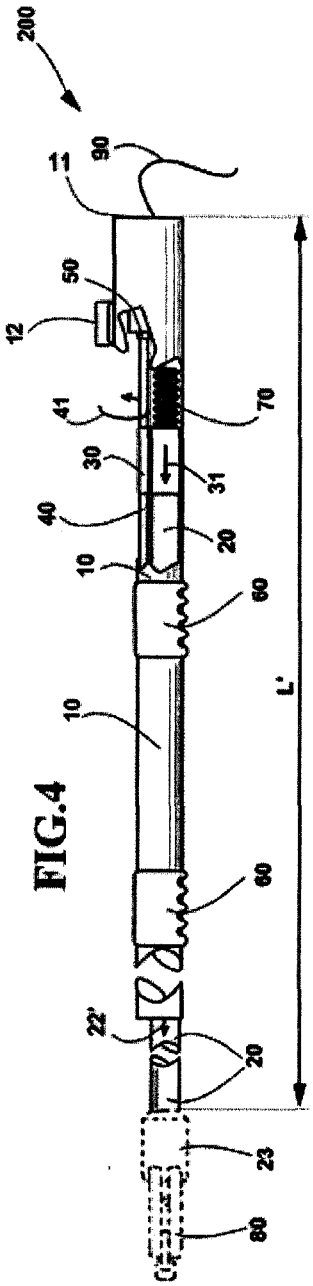


FIG.4

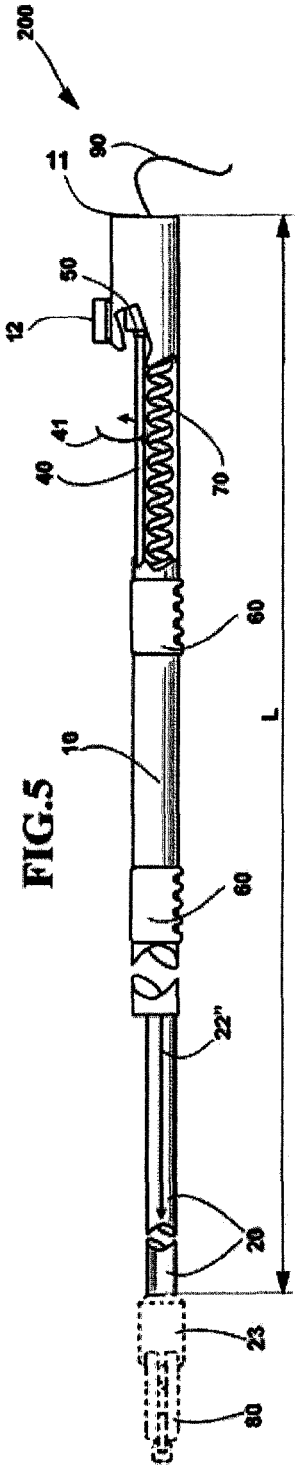


FIG.5

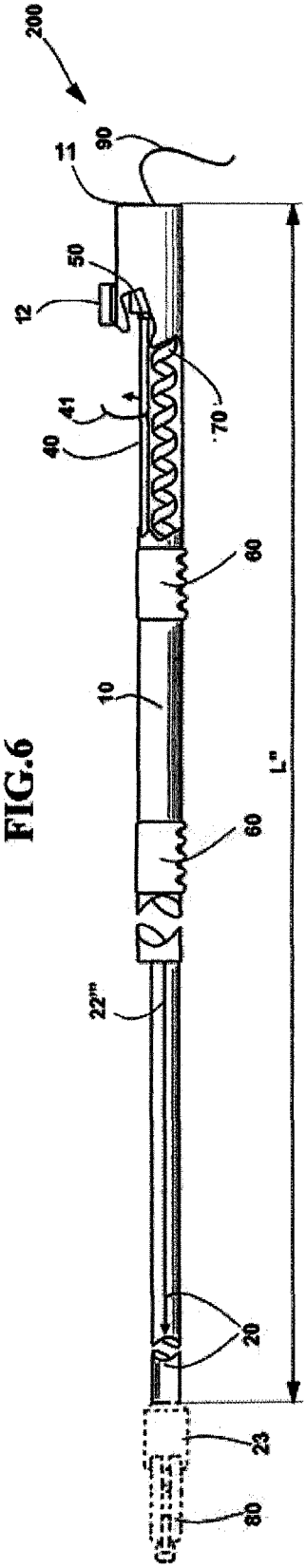
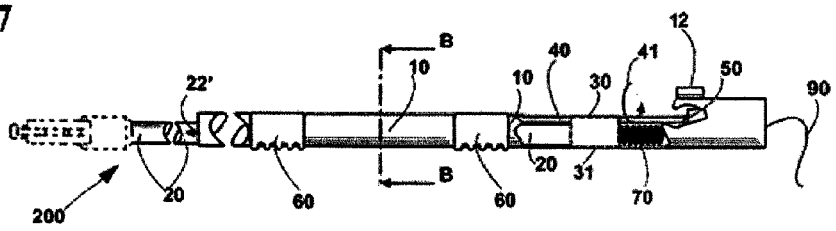


FIG.6

FIG.7



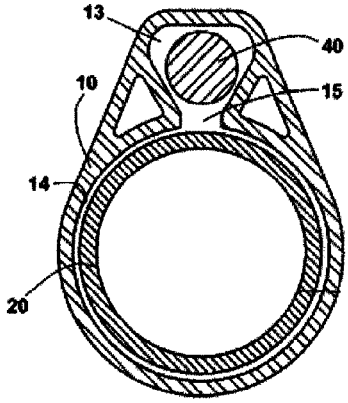
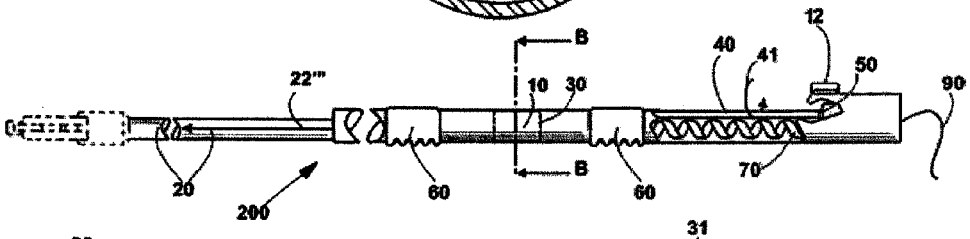


FIG.8
B-B

FIG.9



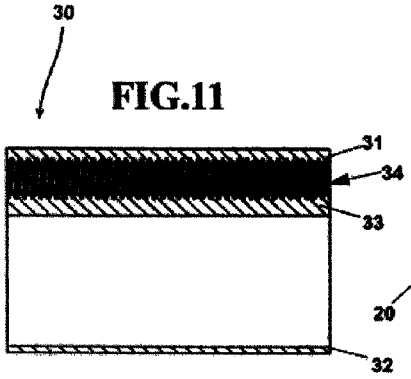


FIG.11

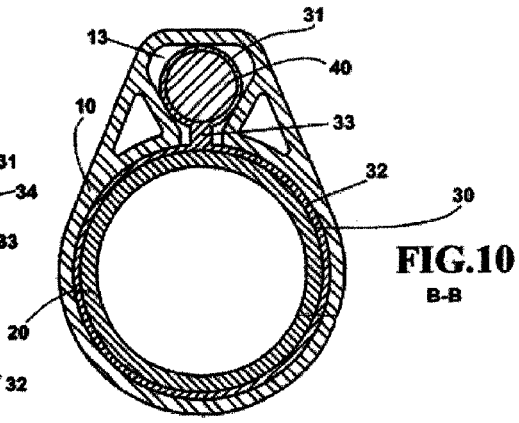


FIG.10
B-B

FIG.12

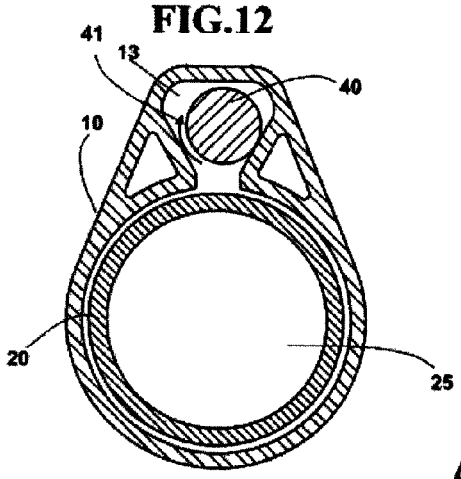


FIG.13

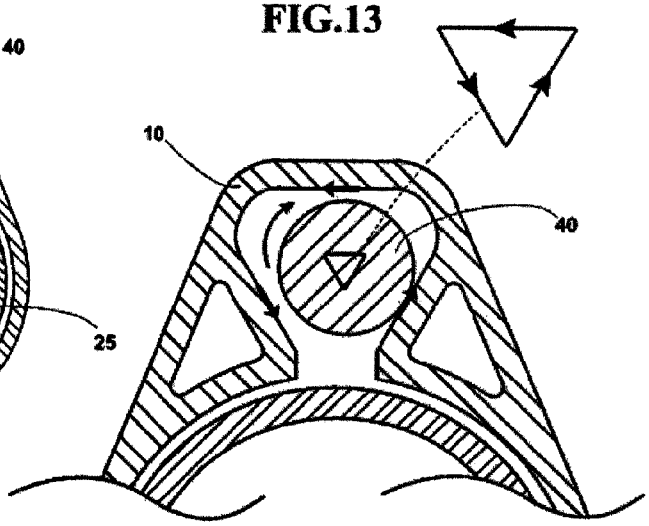


FIG.14

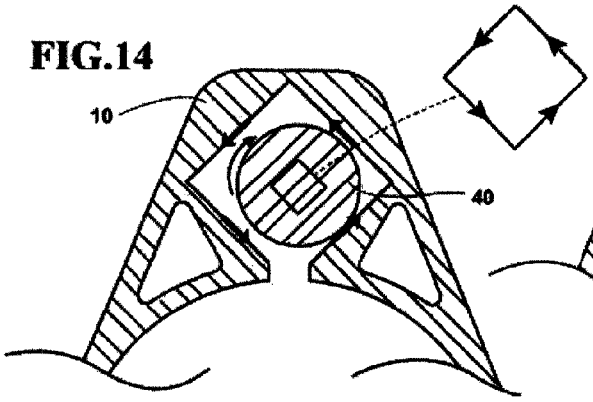
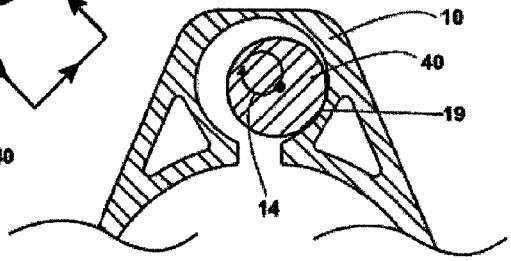


FIG.15



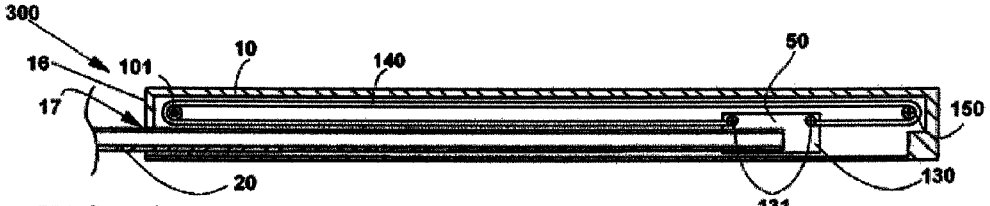


FIG.16

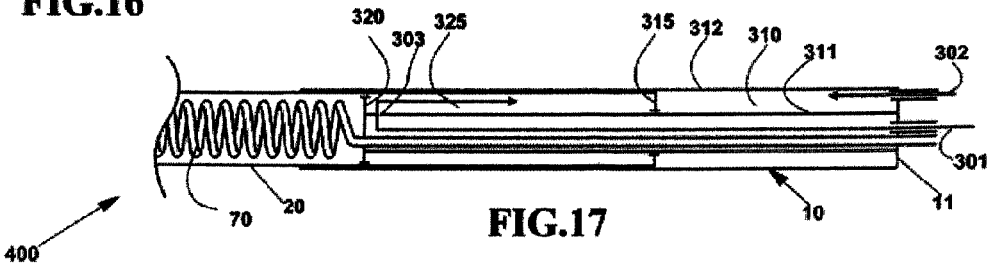


FIG.17

FIG.18

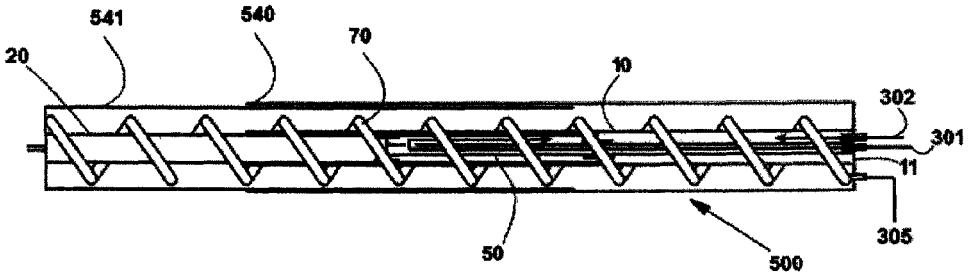
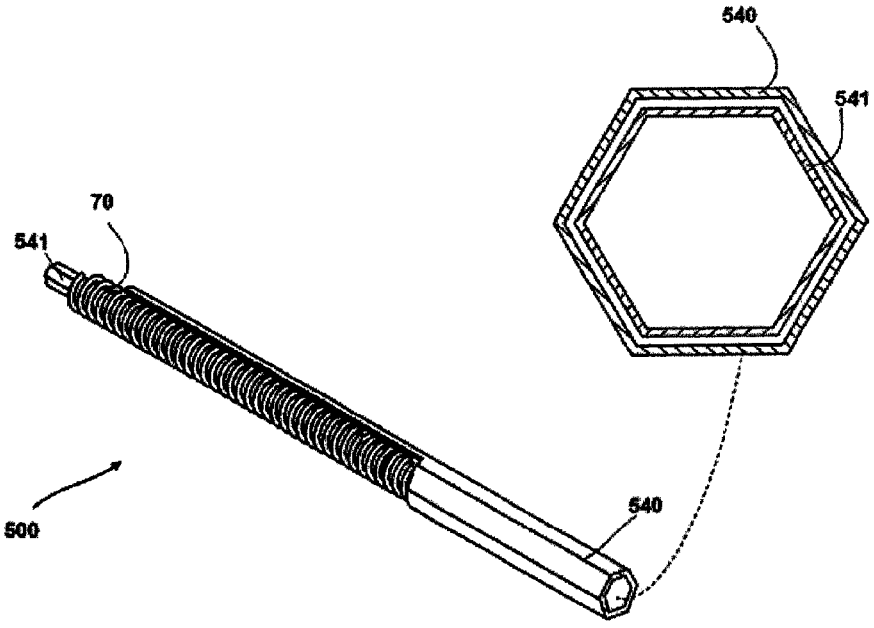


FIG.19



TELESCOPIC ROD FOR HANDLING A TOOL

FIELD OF THE INVENTION

The present invention relates to a telescopic rod for handling a tool, for example for household or industrial use, or for agricultural use, for example an elongated handle, in particular to operate an harvesting or a cutting tool at a desired height above the head of a user.

The rods of this type have a gripping end which can be gripped by a user, and a holding end, where the tool can be supported, in such a way that the user can bring the tool to a desired location above the head of a user by the rod. The rod has a gripping rod member and a holding rod member, which are engaged in a telescopic way with each other.

BACKGROUND OF THE INVENTION

Telescopic rods of the above mentioned type are known of many kinds. They differ from each other in the way for which they are arranged to increase or reduce their length and in the way for which they are locked/released at a desired length.

They can be used for handling a tool at a desired height above the head of a user, such as tools for harvesting fruit from trees, for cutting tree branches, for painting or brushing ceiling or side walls, for collecting objects from high shelves or closets, or for hanging objects at a desired height, etc.

The telescopic rods for these applications should be very light to permit a user to hold them easily and for a long working time, for example a whole day, and at the same time sufficiently stiff, to hold a tool which may be a motorised tool.

Powered telescopic rods are known for heavy duties, such as for raising loads, for moving working platforms or big tools, telescopic masts. Normally they are powered by hydraulic or pneumatic cylinders. However, hydraulic or pneumatic cylinders would be too bulky and heavy to power telescopic rods for the above applications.

Telescopic rods, also known for harvesting fruit or for cutting branches, have at an end a powered tool and a motor, as for example described in CN201878552. At the other end an electric power supply can be connected, for example a battery. The rod can be elongated or shortened manually and an extensible electrical connection is provided between the gripping end and the tool end, in order to supply the motor of the tool at any length of the rod.

Telescopic rods are also known, as for example described in KR20040072307, for harvesting fruit or for cutting branches that have at an end a tool. At the other end they have a transmission means for transmitting the power to the tool. The rod can be elongated or shortened manually, permitting to transmit the power to the tool at any desired length of the rod.

The steps of manually extending or shortening the telescopic rod require the user to lay the rod on a plane, for example on the ground, to unlock the sliding of the rod, to elongate/shorten the rod, to lock the sliding of the rod and then to raise the rod and operate the tool at the desired height.

However, it is desirable that the rod can be elongated/shortened when it is raised, in order to see directly when the tool is at the desired height from the ground and to avoid problematic steps of laying the rod on the ground, elongating/shortening it and then raising it again.

Telescopic rods are also known for example disclosed in U.S. Pat. No. 5,881,601 depicting an extensible rod which can carry out the extension retraction either manually or aided by a motor. The transmission between the fixed and movable part of the extensible rod comprises a rack. An intermediate member comprises gears that engage with the racks, permitting a relative movement of the two parts. The presence of racks and gears determines risk of jamming and blocking the relative movement, and therefore frequent maintenance.

U.S. Pat. No. 4,924,573 discloses an extensible rod with a screw operation. More precisely, a pruner is disclosed which has a fixed hollow base and a hollow rod extension slidingly engaging with the rod base. An actuation worm drive housed within the hollow base engages with a rack mounted to the rod extension. A motor transmission causes the worm to rotate, and a shift lever causes a gearbox to switch the rotation direction of the worm drive, in order to cause the rod extension to extend or to withdraw.

A disadvantage of the pruner disclosed in U.S. Pat. No. 4,924,573 is that, in order to increase the length of the rod extension, also the worm drive has to be correspondingly long. However, a long worm drive would vibrate transversally very intensely and would hit against the housing within the hollow base and also with the rod extension, disengaging from the rack. This would cause rapid wear and break of the worm drive. For this reason the disclosed pruner cannot be made with a long extension, unless reinforcing very heavily the cross section of the worm drive and of the other components, and then over sizing the whole rod and the weight of the parts and of all the device.

Another limit is that the worm drive rotation has to be significantly limited, to avoid the transversal vibration. However, this causes the extension/withdrawal speed to be very low, with a loss of most of the advantages of having a motorised telescopic rod.

SUMMARY OF THE INVENTION

It is therefore a feature of the present invention to provide a telescopic rod for raising a small object, such as a tool, in which the transmission of the movement of the extension rod has limited vibrations, and therefore low wear and high reliability.

It is another feature of the present invention to provide such a telescopic rod with which the object can be raised and lowered very quickly, without damaging the parts of the device.

It is, furthermore, a feature of the present invention to provide a telescopic rod for raising small objects that is light and easy to use.

It is, furthermore, a feature of the present invention in which a worm drive that can be used for extending/shortening the rod can be very light and cheap, for example of a plastic material.

These and other objects are achieved by a telescopic rod for raising small objects comprising:

a rod base having a base end;

a rod extension slidingly engaging with the rod base;

a support member arranged at a support end of the rod extension opposite to the rod base, the support member configured to support a tool;

an actuation means arranged to push/pull automatically the rod extension with respect to the rod base;

a rod actuation command arranged at the base end to operate the actuation means between:

a push position, in which the actuation means pushes the rod extension with respect to the rod base in order to elongate the telescopic rod;

a pull position, in which the actuation means pulls the rod extension with respect to the rod base in order to shorten the telescopic rod;

a standby position in which the actuation means is inoperative and the telescopic rod can be used at a desired rod length to manoeuvre the tool at a desired height.

According to an aspect of the invention, said actuation unit comprises:

a nut element integral to said rod extension, and a longitudinal screw member that pivotally engages with said rod base.

a motor means that causes said screw member to rotate upon operation by said rod actuation command,

wherein said nut element is arranged to slide within said rod base and to engage with said screw member in such a way that upon rotation of said screw member said rod extension slides within said rod base, and

wherein said rod base has a longitudinal channel in which said screw member engages with play, wherein said longitudinal channel has a polygonal shaped cross-section.

This way, even in the presence of play between the screw member and the channel, rolling vibrations of the screw member in the longitudinal channel is avoided. This advantage of using a polygonal shaped cross-section for the longitudinal channel will be discussed hereinafter.

Advantageously, said polygonal shaped cross-section of said longitudinal channel is a triangular cross-section.

Alternatively, said polygonal shaped cross-section of said longitudinal channel is a square cross-section.

Preferably, said polygonal shaped cross-section of said longitudinal channel is configured relatively to said screw member in such a way that said longitudinal channel has an inner size (D) corresponding to a diameter (D') of said screw member with a predetermined play.

In particular, said predetermined play provides said inner size (D) that is greater than the outer diameter (D') of said screw member from 0.5 mm to 4 mm, in particular from 1 mm to 2 mm.

Advantageously the actuation means is configured to lock the rod extension with respect to the rod base when the rod actuation command is in the standby position. In this way, the rod extension cannot slide in the rod base when the rod has a desired length under the load of the tool or under actions caused by the operation of the tool.

Preferably, said rod base can have a tubular shape with an inner longitudinal chamber, and said nut element has a collar for embracing said rod extension, and said collar slides within said inner longitudinal chamber of said rod base. This way, the rod extension is embraced by the collar, which slides in the rod base, so that the rod extension does not contact the rod base except from the collar, with minimum friction for its translation within the rod base.

In particular, said nut element can be connected to rod extension by a neck, and between said longitudinal channel and said inner longitudinal chamber of said rod base a groove is provided in which said neck slides. This way, the nut element can slide in a guided manner by the neck, with minimum friction, and the rod base can be made as a single piece, for example by extrusion of aluminium or plastics.

Advantageously, said channel has a width less than the diameter of said screw member. This way, any transversal vibration of the screw member cannot cause the screw member to exit from the channel and to touch the rod extension or the rod base.

In view of the above, a very light and low-cost material can be used to build the screw member and the rod base which is useful for limiting the cost and the weight of the telescopic rod. In fact, the polygonal cross section of the channel and the play between channel and screw member avoid contact between them and reduces the wear.

Advantageously, the support member is configured to support a motorised tool and an extensible connection is arranged between the base end and the support end in order to provide a power supply at the support end to power the motorised tool at any relative position between the rod extension and the rod base.

Preferably, a tool command is provided at the base end of the rod base, eventually connected to an extensible connection to turn on/off the motorised tool.

In a second aspect of the invention, the actuation means that is arranged to push/pull automatically the rod extension with respect to the rod base comprises a tendon that has an anchoring point fixed to the rod extension. An idle pulley and a motorised pulley are provided which pivotally engage with the rod base, and a housing channel is provided in the rod base to protect the pulleys. This way, the single tendon can be used as push/pull member, and the actuation can be light and easy to operate.

In a third aspect of the invention, the actuation means is arranged to push/pull automatically the rod extension with respect to the rod base end comprises a pneumatic or hydraulic actuation means, with a first fluid passage and a second fluid passage on the rod base, and a command valve, for selectively entering fluid into the first fluid passage or into the second fluid passage. The rod base and the rod extension are arranged in such a way that fluid selectively entered in the first annular chamber or in the second annular chamber causes a relative movement of the rod extension with respect to the rod base in order to elongate or shorten the telescopic rod.

In this case, the rod base forms an annular chamber communicating with the first fluid passage and the rod extension forms a second annular chamber, communicating with the second fluid passage. The rod base has an internal tube connected to a steady flange. The rod extension has a flanged portion slidingly and tightly engaging with the inner cylindrical wall of the rod base and with the outer wall of the inner tube. In the second annular chamber an opening on the internal tube is realized at the opposite end to that fitted on the rod base end, corresponding to the second fluid passage. In this way, the fluid entered though the second fluid passage enters the internal tube, passes through the opening and enters the second annular chamber pushing on one side of the flanged portion causing the telescopic rod to shorten, whereas fluid entered through the first fluid passage enters the first annular chamber and pushes the other side of the flanged portion, causing the rod extension, connected to this flange, to elongate. A command valve is provided to enter selectively fluid through the first or the second passage, or to lock fluid in the both respective chambers, causing the telescopic rod to remain locked at a desired length. Advantageously, an anti-rotation means is provided to prevent a rotation of the rod extension with respect to the rod base.

In a first possible embodiment, the anti-rotation means comprises a protrusion or a recess made along an external wall of the rod extension, and a recess or a protrusion, respectively, made along an inner wall of the rod base, the protrusion and the recess adapted to engage with each other and to avoid a relative rotation of the rod extension respect to the rod base.

Alternatively, the same cylindrical actuation means previously described, free to rotate, can be realized with a small diameter (for example with a diameter of only 20 mm and a pressure of 6 bar the forces can be more than enough) and be housed in a traditional telescopic system in which the same non-circular profile of the two steady and sliding parts guarantees the anti-rotation.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be now shown with the description of an exemplary embodiment thereof, exemplifying but not limitative, with reference to the attached drawings, wherein:

FIG. **1** is a diagrammatical view of a telescopic rod for handling a tool according to the invention;

FIG. **2-3** is a diagrammatical view of a first embodiment, of the telescopic rod of the invention, with rod extension moved by a screw mechanism;

FIG. **4-6** are partially cross-sectional views of the telescopic rod, of FIG. **2** in three operative positions.

FIG. **7** is the telescopic rod of FIG. **2-3** in an operative position and FIG. **8** is a cross-section of according to arrows B-B of FIG. **7**;

FIG. **9** is the telescopic rod of FIG. **2-3** in another operative position and FIG. **10** is a cross-section of according to arrows B-B of FIG. **9**;

FIG. **11** is a longitudinal cross-section of a nut element of a screw mechanism of a telescopic rod according to FIGS. **2-10**.

FIG. **12** is a cross-sectional view similar to FIG. **8** of the engagement with play of a screw member with a longitudinal channel and FIG. **13** is an enlarged partial view thereof;

FIGS. **14** and **15** are cross-sectional partial views similar to FIG. **13** but related to different embodiments of the shape of the channel;

FIG. **16** shows a different embodiment of the actuating means of the telescopic rod, operated by a motorised tendon;

FIG. **17** shows a further different embodiment of the actuating means of the telescopic rod, comprising a pneumatic or hydraulic means;

FIGS. **18-19** show an anti-rotation system for the pneumatic or hydraulic version of the telescopic rod of FIG. **17**.

DESCRIPTION OF PREFERRED EXEMPLARY EMBODIMENTS

With reference to FIG. **1**, a telescopic rod **100** for raising a small object **80** comprises a rod base **10**, which has a base end **11**, and a rod extension **20** that slidingly engages with rod base **10**.

A support member **23** is provided arranged at a support end **21** of rod extension **20** opposite to rod base **10**. In particular, support member **21** is configured to support a tool **80**, which can be any tool that has to be operated at a desired height over the head of a user. The tool can be a harvesting tool, a cutter for example for high pruning, a tool for working on high walls or ceilings, for example a painting tool.

In relation to the different position reached by rod extension **20** with respect to rod base **10**, telescopic rod **100** reaches a different length, and tool **80** can be raised and handled by telescopic rod **100** over the head of a user, not shown, at a different height.

According to the invention, an actuation means **50** is arranged to push/pull automatically rod extension **20** with respect to rod base **10**. In order to operate actuation means **50**, a rod actuation command **12** is arranged proximate to base end **11**.

In particular, rod actuation command **12** is configured to operate actuation means **50**, and can take:

a push position, in which actuation means **50** pushes rod extension **20** with respect to rod base **10** in order to elongate rod **100**,

a pull position, in which actuation means **50** pulls rod extension **20** with respect to rod base **10** in order to shorten telescopic rod **100**,

and a standby position, in which actuation means **50** is inoperative and rod base **10** can be used at a desired rod length L (FIG. **5**) to manoeuvre tool **80** at a desired height (FIG. **5**).

Preferably, actuation means **50** is configured to lock rod extension **20** with respect to rod base **10** when rod actuation command **12** is in the standby position. The fact that the actuation means locks the position is very useful, because no additional lock means are required, which should be manually operated or additional automatic lock means should be added.

In an exemplary embodiment, support member **23** is configured to support a motorised tool **80**. In this case, an extensible connection **70** (FIGS. **3-6**) may be arranged between base end **11** and support end **21**, in order to provide a power supply at support end **21** to power motorised tool **80** at any relative position between rod extension **20** and rod base **10**. In particular, the extensible connection can be a coil arranged between rod extension **20** and rod base **10**.

In this case, a tool command **95** is preferably provided at base end **11**, eventually connected by a generic connection means **90** to turn on/off motorised tool **80**. In particular, a multiple command can be provided that comprises the rod actuation command and the tool command.

Advantageously, at least two handle portions **60** are provided along rod base **10**. In particular telescopic rod **10** of FIG. **1** has two sleeve handles **60** fixed, or slidable along rod base **10**, for the grip of the hands of the user when handling the rod in order to manoeuvre the tool.

With reference to FIGS. **2** and **3**, in a preferred exemplary embodiment of the invention, a telescopic rod **200** comprises a screw mechanism **30-40** to move rod extension **20** with respect to rod base **10**. For instance, actuation means **50** may comprise a nut element **30** integral to rod extension **20**, and a longitudinal screw member **40** that pivotally engages with rod base **10**. This is shown more in detail in the partial longitudinal cross-sectional view of FIG. **3**, along with extensible connection **70**, which is optional in this preferred exemplary embodiment.

Actuation means **50** may comprise a motor means that causes screw member **40** to rotate upon operation by rod actuation command **12**, according to a sense of rotation **41**.

In an embodiment of the invention, nut element **30** can be arranged to slide in rod base **10** and to engage with screw member **40** in such a way that, upon rotation of screw member **40** according to rotation sense **41**, or according to a rotation sense opposite to rotation sense **41**, rod extension **20** slides within rod base **10** according to a slide direction **31** of nut element **30** to elongate telescopic rod **200**, or to a slide direction opposite to direction **31** to shorten telescopic rod **200**, respectively.

Telescopic rod **200** of FIGS. **2** and **3** is shown in three different configurations in FIGS. **4-6**. In FIG. **4**, a retracted configuration of telescopic rod **200** is shown, in which nut element **30** is at a position closer to base end **11** of rod base **10**, rod extension **20** is retracted within rod base **10**, and

telescopic rod **200** has a minimum length L'. In FIG. **6**, a fully extended configuration is shown, in which nut element **30** is at a farther position, not shown, from base end **11**, rod extension **20** is substantially fully elongated out of rod base **10**, and telescopic rod **200** is at a maximum length L". In FIG. **5**, an intermediate position is shown, in which nut element **30** is at an intermediate distance from base end **11**, rod extension **20** has an intermediate elongation out of rod base **10**, and telescopic rod **200** has an operating length L intermediate between minimum length L' and maximum length L".

Still with reference to FIG. **3**, rod base **10** has a longitudinal channel **13** in which screw member **40** engages with play, in particular, channel **13** have an inner size D that corresponds to the diameter D' of screw member, in particular with a play between preferably from 0.5 mm to 4 mm, in particular from 1 mm to 2 mm.

In a preferred embodiment, longitudinal channel **13** has a shaped cross-section, in particular a polygonal cross-section selected among a triangular or square, (FIG. **12-14**) cross-section. Most preferably, as shown for instance in FIGS. **8**, **10**, **12** and **13** longitudinal channel **13** has a substantially triangular cross-section.

In the polygonal cross section any transversal vibration of the screw member would cause a hit of the screw member with the internal polygonal flat faces of the longitudinal channel. However, between a contact with a face and another face, a detachment of the screw member from the inner surface of the channel would occur, reducing the wear and also avoiding that the screw member is subject to torque by rolling within the channel, and the to serious wear and heating, up to breaking. This technical effect is remarkably higher in case of the square cross section, and even more in case of the triangular cross section.

The cross-sectional view of FIG. **15** shows, instead, a round, substantially circular cross-section. The advantages of a shaped, cross-section of longitudinal channel **13** will be discussed hereinafter. Also this solution can be advantageous, owing to the engagement with play.

FIGS. **7** and **9** show longitudinal, partially sectional views of telescopic rod **200** in a less elongated configuration and in a more elongated configuration, respectively. In these two configurations of rod **200**, rod extension **20** along with nut element **30** has two different positions along rod base **10**. FIGS. **8** and **10** show two cross-sectional views of telescopic rod **200** taken at a same cross-section B-B of rod base **10**. In the more elongated configuration of FIGS. **9** and **10**, section plane B-B cuts nut element **30**. On the contrary, in the less elongated configuration of FIGS. **7** and **8**, nut element **30** is far away from section plane, therefore nut element **30** cannot be seen in FIG. **10**.

In particular, rod base **10** is a tubular member, and has an inner longitudinal chamber **14**, which can be seen in FIG. **8**. As shown in FIG. **11**, nut element **30** has a nut portion **31** in which a through screw hole **34** is adapted to engage with screw member **40**, and a collar **32** for embracing rod extension **20**. Collar **31** is adapted to slide within inner longitudinal chamber **14** of rod base **10**. Still with reference to FIG. **11**, nut portion **31** of nut element **30** is connected to collar **32** by a neck **33**. Between channel **14** and inner longitudinal chamber **13** (FIG. **8**) of rod base **10**, a groove is present in which neck **32** can slide.

FIG. **12** is a cross-sectional view like cross-sectional view of FIG. **8**, in which screw member **40** is shown in an offset position with respect to longitudinal channel **13** of rod base **10**. This corresponds to what is likely to happen during the operation of actuation where portions of screw member **40** are away from nut element **30** and may have contact with a wall of longitudinal channel **13** due to vibrations, own weight and torque, etc. FIG. **13** shows a detail of the cross-sectional view of FIG. **12**, while FIGS. **14** and **15** show with the same magnification a similar behaviour of screw member **40** in a longitudinal channel that has a square or a substantially circular cross-section, respectively.

In the case (FIG. **15**) of a circular cross-section (the more intuitive) this play would generate vibration, especially at high rotation speed, very strong and unacceptable. Indeed, given the considerable length and the inevitable flexibility of the screw, it will have surely contact at random points with the longitudinal channel **13** of rod base **10**. In these points the slight centrifugal force due to eccentric rotation pushes the screw to adhere to the wall of the longitudinal channel **13** forcing the screw, rather than to slip, to roll inside it with a circular path, in the opposite direction to the rotation. Given the little diameter differences, at every turn of the screw corresponds many more rounds of this circular movement. It therefore triggers a circular oscillation at very high frequency, which causes intense centrifugal forces which enhance this adhesion and exacerbates the phenomenon, making it unacceptable.

On the contrary, in the case of the polygonal cross-section of FIG. **13** or **14**, any initial adhesion force generates a trajectory of small straight line segments which, as such do not generate any additional centrifugal force, therefore not increases initial adhesion and not amplifies the small initial forces.

This is also particularly important if the members which come into contact are made of a light, delicate and inexpensive material, such as a common plastic material, which is the most preferred choice and at the same time it limits the cost and the weight of the telescopic rod.

FIG. **16** shows a partial longitudinal sectional view of a telescopic rod **300** according to another exemplary embodiment of the invention. Telescopic rod **300** comprises a rod base **10** and a rod extension **20** that slidingly engages with rod base **10** and is partially housed in a longitudinal housing **140** defined by rod base **10**. A tool-side portion of rod extension **20** protrudes out of rod base **10** through a an opening **17** made through a top wall i.e. end wall **16** of rod base **10**. Rod extension **20** is integrally arranged on a slide element **130**, which is slidably arranged inside longitudinal housing **140** within rod base **10**.

Actuation means **50** of telescopic rod **300** comprises a tendon **140** that has two anchoring points **131** fixed to slide element **130**. Tendon **140** is held between two pulleys **101**,**150**, in particular between an idle pulley **101** and a motorised pulley **150** which pivotally engage with rod base **10**. By rotating motorised pulley **150** clockwise or counterclockwise, slide element **130** is caused to slide towards or away from opening **17**, and the protruding portion of rod extension **20** is lengthened or shortened, respectively, which increases or decreases the length of telescopic rod **300**.

FIG. **17** shows a telescopic rod **400** according to a further exemplary embodiment of the invention, which comprises a pneumatic or hydraulic actuation means.

The pneumatic or hydraulic actuation means comprises a first fluid passage **301** and a second fluid passage **302** made through a wall of the rod base. In the telescopic rod partially shown in FIG. **17**, fluid passages **301**,**302** are made through a wall of base end **11** of rod base **10**. Rod base **10**, rod extension **20**, are arranged to form fluid annular chambers **310**,**325** within rod base **10** in such a way that, by selectively entering fluid into one of first and second fluid passages **301**,**302** and allowing fluid to flow out through the other

fluid passage, rod extension **20** is caused to retract into rod base **10** or to elongate out of rod base **10**. Moreover, fluid chambers **310**,**325** are arranged such that by blocking fluid within them, rod extension **20** remains locked at a desired length.

To this purpose, the pneumatic or hydraulic actuation means may comprise a command valve system, not shown, arranged to allow the fluid to enter into first fluid passage **301** or into second fluid passage **302**, or to block both fluid passages **301**,**302** so that fluid is blocked within fluid chambers **310**,**325**, and rod extension **20** remain blocked at a desired length. The command valve system may comprise one or more valves in an arrangement that is obvious for a skilled person, therefore it will not be discussed any further.

In the embodiment shown in FIG. **17**, the rod extension **20** slidingly and tightly engages the inner wall of the rod base **10** and the outer boundary of the flange **320**. Said rod extension **20** has a flanged portion **315** slidingly and tightly engaging with outer cylindrical wall of the internal tube **311** and the inner wall of the rod base **10**. The flange **320** is connected to the internal tube **311** which is connect to the base end **11** of the rod base **10** being so part of the stationary part of this embodiment.

So, annular fluid chamber **310** is confined by the internal wall of the barrel base **10**, by the base end **11**, by the outer wall of the internal tube **311** and by the sliding flange **315** fixed to the sliding rod **20**; Annular fluid chamber **325** is confined by the internal wall of the sliding rod **20**, by the flange **320** fixed to the internal tube **311**, by the outer wall of the internal tube **311** and by the sliding flange **315** fixed to the sliding rod **20**.

Annular chamber **310** is provided communicating with fluid passage **302**, and annular chamber **325** is provided communicating, by means of the internal tube **311** and the opening **303**, with fluid passage **301**.

By blowing fluid into fluid passage **301**, when passage **302** is not blocked, fluid pushes against the left drawing face of the flange **315** causing a rearward slide movement of rod extension **20** with respect to rod base **10**, therefore rod extension **20** retracts within rod base **10** and, accordingly, telescopic rod **400** shortens. On the other hand, by blowing fluid into fluid passage **302**, when passage **301** is not blocked, fluid pushes against a base-side face of flange portion **315** causing a forward slide movement of rod extension **20** with respect to rod base **10**, therefore rod extension **20** is pushed forward out of rod base **10**, and, accordingly, telescopic rod **400** lengthens. If fluid is blocked within annular fluid chamber **310** and annular fluid chamber **325**, for instance by blocking both fluid passages **301**,**302** by the command valve, extension rod **20** remains fixed at a corresponding position with respect to rod base **10**, and telescopic rod **400** remains at a corresponding desired elongation. Flanges **315** and **320** are provided with proper and not described sealing means to permit the fluid tight and sliding engagement and keep the fluid within the chambers in order to avoid losses and to maintain the desired elongation during the use of the rod.

An anti-rotation means can be provided arranged to prevent a rotation of the rod extension with respect to the rod base.

In a first embodiment, not shown, the anti-rotation means comprises a protrusion or a recess made along rod extension, and a recess or a protrusion, respectively, made along rod base, that engage with each other avoiding a relative rotation of the rod extension with respect to the rod base.

In a second embodiment, with reference to FIGS. **18** to **19**, the anti-rotation means comprises a telescopic rod **500** still equipped with a pneumatic or hydraulic actuation means of the type described with reference to telescopic rod **400** of FIG. **17**. Telescopic rod **500** comprises a base casing **540** and an extension casing **541**, integral to rod base **10** and, respectively, to rod extension **20**. More in detail, base casing **540** and extension casing **541** are arranged in such a way to engage telescopically one with each other, in order to guide the rod extension and the rod base and to avoid any rotation of the rod extension with respect to the rod base. In particular, the base casing and the extension casing can have a longitudinal protrusion/recess engaging one with each other, or have, preferably, a shaped cross-section, for example hexagonal, by which reciprocal rotation is impeded.

To connect the supported tool to a power source, an electric or pneumatic or hydraulic connection is also shown, which advantageously can be a coil arranged outside the internal actuation means and inside the base casing **540** and the extension casing **541**.

The foregoing description of exemplary embodiments will so fully reveal the invention according to the conceptual point of view, so that others, by applying current knowledge, will be able to modify and/or adapt for various applications such embodiment without further research and without parting from the invention, and, then it is therefore to be understood that such adaptations and modifications will have to be considered as equivalent to the specific embodiment. The means and the materials to realise the different functions described herein could have a different nature without, for this reason, departing from the field of the invention. It is to be understood that the phraseology or terminology that is employed herein is for the purpose of description and not of limitation.

The invention claimed is:

1. A telescopic rod configured to handle an object or a tool at a desired height above the head of a user, comprising:

a rod base having a base end;

a rod extension slidingly engaging with said rod base;

an actuation unit arranged to push/pull said rod extension with respect to said rod base;

a support member arranged at a support end of said rod extension opposite to said rod base, said support member being configured to support the tool;

a rod actuation command arranged at said base end to operate said actuation unit;

wherein said actuation unit comprises:

a nut element integral to said rod extension, and a longitudinal screw member that pivotally engages with said rod base;

a motor means that causes said screw member to rotate upon operation by said rod actuation command;

wherein said nut element is arranged to slide within said rod base and to engage with said screw member in such a way that, upon rotation of said screw member, said rod extension slides within said rod base; and

wherein said rod base has a longitudinal channel in which said screw member engages with a predetermined play, wherein said longitudinal channel has a polygonal-shaped cross-section.

2. The telescopic rod according to claim **1**, wherein said polygonal-shaped cross-section of said longitudinal channel is a triangular cross-section.

3. The telescopic rod according to claim **1**, wherein said polygonal-shaped cross-section of said longitudinal channel is a square cross-section.

4. The telescopic rod according to claim **1**, wherein said polygonal-shaped cross-section of said longitudinal channel

is configured relative to said screw member in such a way that said longitudinal channel has an inner size corresponding to an outer diameter of said screw member with said predetermined play.

5. The telescopic rod according to claim **4**, wherein said predetermined play provides said inner size that is greater than the outer diameter of said screw member from 0.5 mm to 4 mm.

6. The telescopic rod according to claim **4**, wherein said predetermined play provides said inner size that is greater than the outer diameter of said screw member from 1 mm to 2 mm.

7. The telescopic rod according claim **1**, wherein said rod base has a tubular shape with an inner longitudinal chamber, and said nut element has a collar for embracing said rod extension, and said collar slides within said inner longitudinal chamber of said rod base.

8. The telescopic rod according to claim **7**, wherein said nut element is connected to the rod extension by a neck, and, between said longitudinal channel and said inner longitudinal chamber of said rod base, a groove is provided in which said neck slides.

9. The telescopic rod according to claim **7**, wherein said groove has a width less than the diameter of said screw member.

10. The telescopic rod according to claim **1**, further comprising an electric, pneumatic, or hydraulic connection to connect the supported tool to a power source, said electric, pneumatic, or hydraulic connection comprising a coil arranged outside said actuation unit, and inside a base casing and an extension casing.

11. The telescopic rod according to claim **1**, wherein said rod actuation command is arranged to operate said actuation unit between:

- a push position, in which said actuation unit pushes said rod extension with respect to said rod base in order to elongate said telescopic rod;
- a pull position, in which said actuation unit pulls said rod extension with respect to said rod base in order to shorten said telescopic rod; and
- a standby position in which said actuation unit is inoperative, and said telescopic rod can be used at a desired rod length to maneuver said tool at a desired height.

12. The telescopic rod according to claim **1**, wherein said support member is configured to support the tool, wherein said tool is selected from the group consisting of an electric tool, a pneumatic tool, and a hydraulic tool, and an extensible connection is arranged between said base end and said support end in order to provide a power supply at said support end to power said tool at any relative position between said rod extension and said rod base.

13. The telescopic rod according to claim **12**, wherein a tool command is provided, by a connection at said base end connected to said extensible connection, to turn on or turn off said tool.

14. The telescopic rod according to claim **13**, wherein the tool command is arranged at said base end.

15. The telescopic rod according to claim **1**, comprising a base casing integral with said rod base, and an extension casing integral with said rod extension.

16. A telescopic rod configured to handle an object or a tool at a desired height above the head of a user, comprising:

- a rod base having a base end;
- a rod extension slidingly engaging with said rod base;
- an actuation unit arranged in order to push/pull said rod extension with respect to said rod base;
- a support member arranged at a support end of said rod extension opposite to said rod base, said support member being configured to support the tool;
- a rod actuation command arranged at said base end to operate said actuation unit;
- wherein said actuation unit comprises a tendon that has anchoring points fixed by means of a connection support to said rod extension, wherein an idle pulley and a motorized pulley are provided, which pivotally engage with said rod base, and a housing is provided within said rod base to house said pulleys.

17. A telescopic rod configured to handle an object or a tool at a desired height above the head of a user, comprising:

- a rod base having a base end;
- a rod extension slidingly engaging with said rod base;
- an actuation unit arranged in order to push/pull said rod extension with respect to said rod base;
- a support member is arranged at a support end of said rod extension opposite to said rod base, said support member configured to support the tool;
- a rod actuation command arranged at said base end to operate said actuation unit;
- wherein said actuation unit, the rod base, and the rod extension form a pneumatic or hydraulic actuation unit, with a first fluid passage and a second fluid passage in said rod base, wherein fluid is selectively entered into said first fluid passage, or into said second fluid passage, wherein said rod base and said rod extension are arranged in such a way that fluid selectively entered into said first fluid passage or into said second fluid passage causes a relative movement of said rod extension with respect to said rod base in order to elongate or to shorten said telescopic rod.

18. The telescopic rod according to claim **17**, wherein:

- said rod base has an annular chamber communicating with said first fluid passage and an outer annular chamber communicating with said second fluid passage;
- said rod base comprises an inner tube defining an inner wall of said annular chamber, and an inner cylindrical wall defining an outer wall of said annular chamber, and within which said rod extension slidingly and tightly engages;
- said rod extension has a flanged portion slidingly and tightly engaging with said inner cylindrical wall of said rod base;
- into said annular chamber, an opening is made in said inner tube at an end of said inner tube opposite to said first and second fluid passages;
- a flange connected to the inner tube
- wherein the fluid selectively entered into said first or said second passage causes said telescopic rod to shorten, or to elongate, or to lock fluid in said annular chambers, causing said telescopic rod to remain locked at a desired length.

19. The telescopic rod according to claim **18**, comprising an anti-rotation means arranged to prevent a rotation of the rod extension with respect to the rod base.

20. The telescopic rod according to claim **19**, wherein said anti-rotation means is a protrusion, or a recess made along an external wall of the rod extension, and a recess, or a protrusion, respectively, made along an inner wall of the rod base, the protrusion and the recess adapted to engage with each other and to avoid a relative rotation of the rod extension with respect to the rod base.

21. The telescopic rod according to claim 19, wherein said anti-rotation means comprises the telescopic rod having the pneumatic or hydraulic actuation unit.

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